

AMENDMENTS TO THE CLAIMS:

Claim 18. (Currently amended) A method for driving an ink jet recording head,
comprising:

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applying a driving voltage to an electro-mechanical converter to deform the electro-mechanical converter to thereby change a pressure in the pressure generating chamber filled with ink, thus ejecting ink droplets with a size of about 5 to about 25 μm through a nozzle in communication with the pressure generating chamber, wherein said applying said driving voltage comprises:

~~at least~~ a first voltage changing process ~~for applying~~ which applies a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process ~~for then applying~~ which applies a voltage in a direction that reduces the volume of said pressure generating chamber; and

a third voltage changing process ~~for applying~~ which applies a voltage in a direction that increases the volume of said pressure generating chamber again; ~~setting, wherein~~ voltage changing times t_2 and t_3 during the second and third voltage changing processes ~~so as to~~ have such lengths as shown below, relative to a resonance frequency T_c of a pressure wave generated in the pressure generating chamber:

$$0 < t_2 < T_c/2$$

$0 < t_3 < T_c/2$; and ~~providing, wherein~~ said nozzle ~~with an~~ has an opening diameter of about 20 to less than about 30 μm ~~opening diameter to eject said ink droplets in a size of~~ ~~about 5 to about 25 μm size.~~

Claim 19. (Currently amended) A method for driving an ink jet recording head, comprising:

applying a driving voltage to an electro-mechanical converter to deform the electro-mechanical converter to thereby change a pressure in ~~the~~ a pressure generating chamber filled with ink, thus ejecting ink droplets with a size of about 5 to 25 μm through a nozzle in communication with the pressure generating chamber, wherein said applying of said driving voltage comprises:

~~at least~~ a first voltage changing process ~~for applying~~ which applies a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process ~~for then applying~~ which applies a voltage in a direction that reduces the volume of said pressure generating chamber; and

a third voltage changing process ~~for applying~~ which applies a voltage in a direction that increases the volume of said pressure generating chamber again; ~~and, wherein setting~~ voltage changing times t_2 and t_3 during the second and third voltage changing processes ~~are set to~~ have such lengths as shown below, relative to a resonance frequency T_c of a pressure wave generated in the pressure generating chamber:

$$0 < t_2 < T_c/2$$

$0 < t_3 < T_c/2$; ~~and, wherein providing said nozzle with an~~ has an opening diameter of about 20 to less than about 30 μm ~~opening diameters to eject said ink droplets in a size of about 5 to about 25 μm size, and~~ wherein a start time of said third voltage changing process is about the same as an end time of said second voltage changing process.

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Claim 20. (Currently amended) A method for driving an ink jet recording head, comprising:

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applying a driving voltage to an electro-mechanical converter to deform the electro-mechanical converter to thereby change a pressure in the pressure generating chamber filled with ink, thus ejecting ink droplets of a size of about 5 to 25 μm through a nozzle in communication with the pressure generating chamber, wherein said applying said driving voltage comprises:

at least a first voltage changing process ~~for applying~~ which applies a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process ~~for then applying~~ which applies a voltage in a direction that reduces the volume of said pressure generating chamber; and

a third voltage changing process ~~for applying~~ which applies a voltage in a direction that increases the volume of said pressure generating chamber again; and

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15 a fourth voltage changing process ~~for applying~~ which applies voltage in a direction that reduces the voltage of said pressure generating chamber, after said first voltage changing process, said second voltage changing process, and said third voltage changing process; wherein setting voltage changing times t_2 and t_3 during the second and third voltage changing processes ~~so as to~~ have such lengths as shown below, relative to a resonance frequency T_c of a pressure wave generated in the pressure generating chamber:

$$0 < t_2 < T_c/2$$

$0 < t_3 < T_c/2$; and, wherein providing said nozzle ~~with an~~ has an opening diameter of about 20 to less than about 30 μm ~~opening diameter to eject said ink droplets in a size of~~ about 5 to about 25 μm size.

Claim 21. (Currently amended) A method for driving an ink jet recording head comprising:

applying a driving voltage to an electro-mechanical converter to deform the electro-mechanical converter to thereby change a pressure in the pressure generating chamber filled with ink, thus ejecting ink droplets of a size of about 5 to 25 μm through a nozzle in communication with the pressure generating chamber, wherein said applying said driving voltage comprises:

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at least a first voltage changing process ~~for applying~~ which applies a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process ~~for then applying~~ which applies a voltage in a direction that reduces the volume of said pressure generating chamber; and

a third voltage changing process ~~for applying~~ which applies a voltage in a direction that increases the volume of said pressure generating chamber again; and

Volume
a fourth voltage changing process which applies voltage in a direction that reduces the volume of said pressure generating chamber, after said first voltage changing process, said second voltage changing process, and said third voltage changing process, wherein setting voltage changing times t_2 and t_3 during the second and third voltage changing processes are set to have such lengths as shown below, relative to a resonance frequency T_c of a pressure wave generated in the pressure generating chamber:

$$0 < t_2 < T_c/2$$

$0 < t_3 < T_c/2$; and, wherein providing said a nozzle with an opening diameter of about 20 to less than about 30 μm opening diameter to eject said ink droplets in a size of about 5 to about 25 μm size, wherein the voltage waveform of said driving voltage includes a

~~fourth voltage changing process for applying a voltage in a direction that reduces the volume of said pressure generating chamber, after said first voltage changing process, said second voltage changing process, and said third voltage changing process, and~~ wherein a voltage changing time t_4 during said fourth voltage changing process ~~is set as follows~~ has a length relative to the resonance frequency T_c of the pressure wave generated in said pressure generating chamber as follows:

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$$0 < t_4 < T_c/2.$$

Claim 22. (Currently amended) A method for driving an ink jet recording head comprising:

applying a driving voltage to an electro-mechanical converter to deform the electro-mechanical converter to thereby change a pressure in the pressure generating chamber filled with ink, thus ejecting ink droplets of a size of about 5 to 25 μm through a nozzle in communication with the pressure generating chamber, wherein said applying said driving voltage comprises:

at least a first voltage changing process for applying which applies a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process ~~for then applying~~ which applies a voltage in a direction that reduces the volume of said pressure generating chamber; ~~and~~

a third voltage changing process ~~for applying~~ which applies a voltage in a direction that increases the volume of said pressure generating chamber again;

Volume

a fourth voltage changing process which applies voltage in a direction that reduces the
voltage of said pressure generating chamber, after said first voltage changing process, said

second voltage changing process, and said third voltage changing process; wherein voltage changing times t_2 and t_3 during the second and third voltage changing processes ~~are set to~~ have such lengths as shown below, relative to a resonance frequency T_c of a pressure wave generated in the pressure generating chamber:

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 $0 < t_2 < T_c/2$

$0 < t_3 < T_c/2$, and, wherein providing said a nozzle with an has an opening diameter of

~~about 20 to less than about 30 μm opening diameter to eject said ink droplets in a size of about 5 to about 25 μm size, wherein the voltage waveform of said driving volume includes a fourth voltage changing process for applying a voltage in a direction that reduces the volume of said pressure generating chamber, after said first voltage changing process, said second voltage changing process, and said third voltage changing process, wherein a voltage changing time t_4 during said fourth voltage changing process is set as follows~~ has a length relative to the resonance frequency T_c of the pressure wave generated in said pressure generating chamber as follows:

$0 < t_4 < T_c/2$, and wherein a time interval between a start time of said second voltage changing process and a start time of said fourth voltage changing process is set substantially half the length of the resonance frequency T_c of the pressure wave generated in said pressure generating chamber.
